

The opinion in support of the decision being entered today was **not** written for publication and is **not** precedent of the Board.

Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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**Ex parte** FUSEN E. CHEN, FRANK R. BRYANT and GIRISH A. DIXIT

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Appeal No. 1997-3690  
Application 08/427,163

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ON BRIEF

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Before JERRY SMITH, FLEMING and HECKER, **Administrative Patent Judges**.

FLEMING, **Administrative Patent Judge**.

**DECISION ON APPEAL**

This is a decision on appeal from the final rejection of claim 1-5, 7-13 and 15 through 16. Claims 6 and 14 have been canceled.

The invention relates to forming a transistor spacer endpoint structure in an integrated circuit. Independent claims 1 and 10 are reproduced as follows:

1. A method of forming a sidewall spacer structure of an integrated circuit, comprising the steps of:

forming a gate over a portion of a substrate;

forming a metal oxide layer over the gate and a portion of the substrate, wherein the metal oxide layer is in direct contact with the gate and a portion of the substrate; and

forming oxide sidewall spacers adjacent to the sides of the gate and on top of the metal oxide layer.

10. A method of forming a sidewall spacer structure of an integrated circuit, comprising the steps of:

forming a gate over a portion of a substrate;

forming a metal oxide layer over the integrated circuit, wherein the metal oxide layer is in direct contact with the gate and a portion of the substrate;

forming an oxide layer over the metal oxide layer;

patterning and etching the oxide layer to form sidewall oxide spacers adjacent to each side of the gate and over a portion of the metal oxide layer, wherein the metal oxide layer is an etch stop to the oxide layer during the etching of the oxide layer; and

removing the metal oxide layer not covered by the sidewall oxide spacers.

The references relied on by the Examiner are as follows:

Mizuno	5,119,152	Jun. 2, 1992 (filed March 19, 1991)
Hunter	4,356,623	Nov. 2, 1982

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IBM Technical Disclosure Bulletin, vol. 24, pgs. 1293-1295  
(July 1981 (Tsang)).

Claims 1 through 3, 5 and 9 stand rejected under 35 U.S.C. § 102 as being anticipated by Mizuno. Claim 4 stands rejected under 35 U.S.C. § 103 as being unpatentable over Mizuno in view of Hunter. Claims 7, 10, 11, 13, 15 and 16 stand rejected under 35 U.S.C. § 103 as being unpatentable over Tsang in view of Mizuno.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Briefs<sup>1</sup> and Answer for the details thereof.

#### OPINION

After a careful review of the evidence before us, we agree with the Examiner that claims 1, 3, 5 and 9 are properly rejected under 35 U.S.C. § 102. Thus, we will sustain the rejection of these claims but we will reverse the rejection of

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<sup>1</sup> Appellants' filed an Appeal Brief on November 25, 1996. Appellants' filed a Reply Brief on March 17, 1997. Examiner mailed an office communication on April 28, 1997 stating that the Reply brief has been entered and considered but no further response by the Examiner is deemed necessary.

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the remaining claims on appeal for the reasons set forth  
**infra.**

At the outset, we note that Appellants state on page 5 of the Brief that claims 1 through 3, 5 and 9 are grouped together. We note that Appellants argue all of the claims as a single group in the Brief, however in the Reply Brief Appellants separately argue claim 2. 37 CFR 1.192(c)(7)(July 1, 1996) **as amended at** 60 Fed. Reg. 14518 (March 17, 1995), which was controlling at the time of Appellants' filing the Brief, states:

For each ground of rejection which Appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and, in the argument under paragraph (c)(8) of this section, Appellant explains why the claims of the group are believed to be separately patentable. Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable.

We will, thereby, consider the Appellants' claims 1 through 3, 5 and 9 as standing or falling together and we will treat claim 1 as a representative claim of that group. Furthermore,

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we will treat claim 2 separately.

In regard to the rejection of claims 1-3, 5 and 9 as being anticipated by Mizuno, Appellants argue on page 8 that Mizuno fails to disclose forming the high-dielectric, titanium oxide material in direct contact with the substrate. Appellants point out that Mizuno discloses that the titanium oxide layer is formed on an intermediate gate oxide.

On page 4 of the Examiner's Answer, the Examiner interprets the claim "substrate" as including both the PE-type silicon substrate 11 and the oxide film 12. In response, Appellants on page 3 of the Reply Brief argue that the term substrate must be given the ordinary meaning and also be consistent with the meaning ascribed to the terms by the Appellants.

It is axiomatic that anticipation of a claim under § 102 can be found only if the prior art reference discloses every element of the claim. **See In re King**, 801 F.2d 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1984). "Anticipation is established only when a single prior art reference discloses, expressly or under principles of inherency, each and every

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element of a claimed invention." **RCA Corp. v. Applied Digital Data Sys., Inc.**, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.), **cert dismissed**, 468 U.S. 1228 (1984), **citing Kalman v. Kimberly-Clark Corp.**, 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983).

As pointed out by our reviewing court, we must first determine the scope of the claim. "[T]he name of the game is the claim. **In re Hiniker Co.**, 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998). Claims will be given their broadest reasonable interpretation consistent with the specification, and limitations appearing in the specification are not to be read into the claims. **In re Etter**, 756 F.2d 852, 858, 225 USPQ 1, 5 (Fed. Cir. 1985). In addition, our reviewing court states in **In re Zletz**, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) that "claims be interpreted as broadly as their terms reasonably allow" generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that they were used differently by the inventor. **Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.** 15 F.3d 1573, 1577, 27 USPQ 1836, 1840

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(Fed. Cir. 1993). Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision. **In re Paulsen**, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994).

We note that Appellants' claim 1 simply recites "substrate". The Random House College Dictionary, Revised Edition, 1982, definition of substrate is "a supporting material on which a circuit is formed or fabricated".<sup>2</sup> Thus the term substrate has broad meaning which does not preclude the interpretation that a substrate may include multilayers. Therefore we find that the Examiner's interpretation is proper and that Mizuno's layers 12 and 11 in which the titanium oxide material 15 is in direct contact with gate oxide film 12 properly reads on Appellants claim language of forming a metal oxide layer over a portion of the substrate.

On pages 2 and 3 of the Reply Brief, Appellants further argue that the Examiner makes no pretense of finding the limitation of forming a metal oxide layer over the gate. We

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<sup>2</sup> Copy provided.

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note that in column 3, lines 29-57, Mizuno teaches that the metal oxide layer 15 is formed over the gate 13 and then later etched off the top of gate 13. Therefore we find that Mizuno does teach Appellants' claimed limitation of "forming a metal oxide layer over the gate and a portion of the substrate" as recited in Appellants' claim 1. Therefore we find that Mizuno anticipates Appellants' claimed invention and thereby will sustain the Examiner's rejection of claims 1, 3, 5 and 9.

In regard to the rejection of claim 2 as being anticipated by Mizuno, Appellants argue on page 3 of the Reply Brief, that if the substrate is interpreted as including oxide film 12 as disclosed in Mizuno, the recited gate oxide layer which forms a part of the gate according to claim 2 is absent. We agree. Therefore we will not sustain the Examiner's rejection of claim 2 as being anticipated by Mizuno.

In regard to the rejection of claim 4 as being unpatentable over Mizuno in view of Hunter, the Examiner states that Mizuno does not teach implanting lightly doped drained regions after a sidewall spacer is formed on the gate electrode sidewall. Examiner argues that Hunter discloses forming a sidewall spacer 8 and forming an implant to form a

lightly doped region 10 in the substrate 1. The Examiner argues that it would have been obvious to one of ordinary skill in the art at the time the invention was made to form an implantation after the titanium oxide spacer to form a lightly doped region in the primary reference of Mizuno because of the reasons disclosed therein by Hunter. Examiner points us to column 9, line 50-column 10, line 25. On pages 11 and 12 of the Brief, Appellants argue that claim 4 requires that the lightly doped source and drain (LDD) regions be formed in the substrate after the formation of the metal oxide layer over the gate and a portion of the substrate. Appellants point out that since the lightly doped source-drain regions must extend to a region adjacent to the gate, this step requires that the lightly doped drain region be formed by implantation through the metal oxide layer. Appellants argue that neither Mizuno nor Hunter disclose formation of lightly doped source-drain regions after the formation of the metal oxide layer.

The Examiner has failed to set forth a prima facie case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the express teachings or suggestions found in the

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prior art, or by implications contained in such teachings or suggestions. **In re Sernaker**, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). "Additionally, when determining obviousness, the claimed invention should be considered as a whole; there is no legally recognizable 'heart' of the invention." **Para-Ordnance Mfg. v. SHS Importers Int'l, Inc.**, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995), **citing W.L. Gore & Assocs., Inc. v. Garlock, Inc.**, 721 F.2d at 1548, 220 USPQ at 309.

In response to Appellants' arguments, the Examiner on page 11 of the Brief states that the limitation of implanting through the metal oxide layer is not recited in the rejected claims. Examiner argues that the Hunter reference is relied on only to show forming a lightly doped region by implanting after a spacer has been formed. This is regardless of the particular material, since the spacer is simply being used for its masking capabilities and not for more specific material properties.

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Upon our reading of claim 4, we find that the claim requires that a lightly doped drain region be formed by implantation through the metal oxide layer. We fail to find that the Examiner has come to grips with this limitation and upon our review of the references we fail to find that either reference teaches this limitation. Therefore we will not sustain the Examiner's rejection of claim 4.

In regard to the rejection of claims 7, 10, 11, 13, 15 and 16 under 35 U.S.C. § 103 as being unpatentable over Tsang in view of Mizuno and the rejection of claim 12 under 35 U.S.C. § 103 as being unpatentable over Tsang in view of Mizuno and Hunter, Appellants argue on pages 8 through 11 the Examiner has failed to show any motivation or incentive for combining the teachings of these references. Appellants argue that Mizuno provides no incentive for forming a metal oxide layer in direct contact with the gate and a portion of the substrate. Appellants further argue that Hunter does not disclose any benefits particularly associated with forming the silicone oxide layer spacer in direct contact with the gate or a portion of the substrate.

The Federal Circuit states that "[t]he mere fact that the

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prior art may be modified in the manner suggested by the  
Examiner

does not make the modification obvious unless the prior art suggested the desirability of the modification." **In re Fritch**, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n. 14 (Fed. Cir. 1992), **citing In re Gordon**, 733, 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). It is further established that "[s]uch a suggestion may come from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem." **Pro-mold & Tool Co. v. Great Lakes Plastics, Inc.**, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996), **citing In re Rinehart**, 531 F.2d 1048, 1054, 189 USPQ 143, 149 (CCPA 1976) (considering the problem to be solved in a determination of obviousness). The Federal Circuit reasons in **Para-Ordnance Mfg. Inc. v. SGS Importers Int'l Inc.**, 73 F.3d at 1088-89, 37 USPQ2d at 1239-40, that for the determination of obviousness, the court must answer whether one of ordinary skill in the art who sets out to solve the problem and who had before him in his workshop

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the prior art, would have been reasonably expected to use the solution that is claimed by the Appellant. However, "[o]bviousness may not be established using hindsight or in view of the teachings or suggestions of the invention." **Par Ordnance Mfg. v. SGS Importers Int'l**, 73 F.3d at 1087, 37 USPQ2d at 1239, **citing W.L. Gore & Assocs., Inc. v. Garlock, Inc.**, 721 F.2d at 1551-1553, 220 USPQ at 311-313. In addition, our reviewing court requires the PTO to make specific findings on a suggestion to combine prior art references. **In re Dembiczak**, 175 F.3d 994, 1000-01, 50 USPQ2d 1614, 1617-19 (Fed. Cir. 1999).

Upon our review of the references, we fail to find any reason or suggestion of modifying Tsang to allow the metal oxide spacer to become physically in contact with the gate electrode. Tsang teaches that the metal oxide layer 16 is not in direct contact with the gate electrode 12 but instead has an intermediate layer between them. The Examiner's reasons of modifying Tsang are stated that Mizuno teaches to have the metal oxide spacer physically in contact with the gate electrode because this would prevent modulation of gate

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wrenching fields and control of the hot carrier effect. However the Examiner has not shown that Tsang as disclosed already provides these characteristics. Upon our review of Mizuno we fail to find that Mizuno teaches any benefits associated with forming the metal oxide layer in direct contact with the gate but rather Mizuno merely teaches that interposing a high dielectric material between the gate and a silicone oxide spacer suppresses the gate wrenching field effects and gate capacity. Mizuno does not teach or suggest that the high dielectric material may be separated from the gate by thin oxide as in the metal oxide layer disclosed in Tsang. Therefore, we fail to find that the Examiner has provided any evidence or suggestions of why the proposed modification would have been made by one of ordinary skill in the art.

In view of the forgoing the decision of the Examiner rejecting claims 1, 3, 5 and 9 under 35 U.S.C. § 102 is affirmed; however, the decision of the Examiner rejecting claims 2, 4, 7, 8, 10 through 13, 15 and 16 is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR

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§ 1.136(a).

**AFFIRMED-IN-PART**

JERRY SMITH	)	
Administrative Patent Judge	)	
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MICHAEL R. FLEMING	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
	)	
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STUART N. HECKER	)	
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